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RESEARCHES
ON THE
NATURAL HISTORY
OF
DEATH.

✓
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Washington, D.C.

—A breath thou art,
Servile to all the skyey influences.—SHAKSPEARE.

NEW ORLEANS.

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Researches on the Natural History of Death. By BENNET DOV-
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It is not my intention at present, to attempt even an outline of several of the most important branches of the natural history of death. Its preludes, its characteristics, general and special; its progress, its prognostics, and its pathological anatomy, will be omitted, not for want of facts, but because the facts I have collected on these subjects, are too numerous and unwieldy for the narrow limits to which this paper must be restricted. The pathological anatomy of death, the changes due to the agony *itself*; its immediate antecedents and effects, physical and physiological, including the order in which functions cease, and tissues die, together with the resulting anatomical alteration, being subjects of great importance, and deserving of the fullest investigation, cannot be disposed of in a summary manner. The period intervening between the agony and the usual time of post mortem examination, is rich in facts which have been too much neglected.

As I do not attempt a formal monograph on death, a systematic arrangement will not be expected. I propose to notice, in the first place, the criteria of the certainty of death, particularly the tests of death as set forth by the recent proceedings of the Academy of Sciences of Paris, in the award of the Manni prize; not that I have any ambition to be found in opposition to any opinion expressed by that learned body, but because a slight critical retrospection of the grounds taken in the official acts of the Academy, will enable me to give my views with greater clearness and usefulness. Besides, I speak more as an experimenter than as a critic. An experimenter is entitled, nay, often required, for the sake of perspicuity, to give an estimate of existing doctrines, that his own may be compared therewith. The authority of opinion cannot destroy facts, though it may retard, for a time, their reception and appreciation. Innovations, how true so ever they may be, are seldom received with alacrity, when they conflict with cherished systems. Physiological partizans of every age, meet every discovery, by saying that it is not true; or, if true, not new. Their bundle of opinions having been made up, the withdrawal of one weakens the whole. The detection of an error is in their reckoning, only so much damage to the temple of science.

Brocto-Phantasmist, who saw with his own eyes, the witches dancing on the Hartz mountains, nevertheless, reasons thus:

What is this cursed multitude about?

Have we not long since proved to demonstration,

That ghosts move not on ordinary feet?

But these are dancing just like men and women:

Whereupon, a witch answers;

Any step which in our dance we tread,

If it be left out of his *reckoning*,

*Is it not to be considered as a step.**

The great object of experiment, next to the discovery of truth, is the overthrow of error. A useful distinction this is. Truth is not indebted to erroneous systems.

*Goethe's Faust.

It may be objected to the critical portion of this paper, that it tends to throw doubt on the test adopted by the Academy of Sciences, and substitutes nothing in its place. For my own part, I am satisfied with the ordinary signs, though some of these are not at all describable, by writing or words, but well known to those who have witnessed death. But if a new method be desired, I will propose one in the sequel, though I do not admit the doctrine that it is necessarily the duty of the opponent of an old theory, to produce a new one in its place. It is better to have no theory, than to have an erroneous one, in physiology or physic. Lest it should be thought that this proposed test is the result of mere closet speculation, I must say, that it is founded on numerous prolonged experiments, probably one thousand, made directly on several hundred bodies; (to determine the exact number recorded in nineteen manuscript volumes, might require a week's examination, for which I have not at present the necessary leisure).

Those conversant with forensic medicine, will perceive that the researches have a direct bearing on that subject, since the very best and latest writers assume as data for the determination of several questions in relation to death, data of an uncertain character, as rigidity, contractility, animal heat, the coagulation of the blood, &c.

To prevent misapprehension, I beg leave to make a preliminary remark, that I have repeatedly made on former occasions, namely, that contractility, animal heat, capillary circulation, and the like, do not prove the body to be alive in the popular, legal, and utilitarian sense. The body may be eviscerated; the brain and spinal cord, removed; the arm may be amputated, and yet the flexors of the forearm will contract; complete flexions will take place; weights put into the palm will be raised up; provided, the flexors be uninjured, and the shoulder be secured so as not to roll about. Bichat's fundamental principles of life, but which he regarded as inseparable, namely, contractility and sensibility, are not here really united. As to what is commonly called life, the body may be wholly deprived of it, without necessarily losing muscular contractility or muscular life. An animal, after the removal of its heart, might be burnt to ashes, its heart might pulsate for hours afterwards; yet these pulsations would not be reckoned as life in its ordinary sense, nor would they afford any ground to hope for resuscitation. Hence, this variety of life is not life at all, in the usual sense. It must be admitted, however, that, by all classes of mankind, muscular motion is regarded as a fundamental principle of life. Kant defines life as an internal faculty, producing change, motion, &c., and says that organization is that in which all the parts are mutually ends and means; definitions, which, whether just, or not, proceed from one of the acutest thinkers of modern times, and rivals Bichat's celebrated definition of life, namely, "Life is the sum of the functions by which death is resisted." Life is an aggregation of vital phenomena or of means and ends: death is a destruction or alteration of these means and ends: all those vital phenomena which remain after the extinction of all the useful means and ends of life, do not really constitute life in its ordinary acceptation, or essential conditions, implying thinking, feeling, willing and acting. Put a knife in a dead man's hand percuss the flexors, and perchance, he may stab the operator in the eye,

but this action is not stabbing in the legal or moral sense of that term.

Contractility, in its isolated character, does not prove that life is present in its ordinary or utilitarian sense. Nor is rigidity, as is generally assumed, absolutely incompatible with the contractile power. These forces are neither incompatible nor identical; much less are they connected as cause and effect. Their lines of action cross each other; their essential conditions interfere greatly with their simultaneous manifestations. Rigidity is not really, but apparently, the negation of the contractile force. A man tied hand and foot, has the force, not the necessary conditions, to run a race. The contractile force, and that of the death-stiffness, often exist *simultaneously*. The latter may render the arm motionless—percussion may show a violent *nisus* or unavailing action of the flexor muscles. Now, if by mechanical means, or manipulation, as repeated, forcible flexions and extensions, the limbs be made supple, it is not, as might be supposed, exhausted, but set free, and will act, in some cases, with greater vigor than before the invasion of the rigidity. It is often easy to see that the contractile force acts with as much energy where it fails to accomplish its finality, or end, in these cases of rigidity, as in cases of flexion; for the elevated, ridgy contraction of the fleshy part of the muscle is the same, though motion of the limb there be none. Accidentally, so to speak, they limit, antagonize, and control each other. They are not identical, nor absolutely exclusive of each other, but they mutually influence each other, as the muscular and the gravitative forces do.

Without taking notice of the peculiar physiognomy of the dead, the lividity and cadaveric injection of dependent parts, the flattening of the tissues that sustain the weight of the body, and the other signs of death, of minor importance, I prefer to take the route already indicated, beginning with a slight review of the preludes which led to the institution of the Manni Prize.

In 1837, Professor Manni, of the University of Rome, proposed a special prize of 1,500 francs, to be awarded by the French Academy, for the best work upon the subject of apparent death; with the view of preventing premature interments. Since that period, this prize has been an object of honorable ambition by many candidates, as may be seen, from year to year, in the proceedings of the Academy. M. Donne, in a communication to that body, proposed, as the surest sign of death anterior to putrefaction, the altered condition of the blood-globules. He rejected rigidity as a sign, because it might be simulated, and in some cases of real death it never occurred. (Comp. Rend. v.) M. Lettelier claimed to have discovered the most certain of all signs of death, namely, the non-coagulability of the blood. (Ib. v. 526.) A little dissection, in the latitude of New Orleans, at least, will convince any one that the coagulation of the blood after death is a very common occurrence. It were, however, alike tedious and useless to enumerate all the wild speculations upon this subject, so exciting to the French mind. The competitors for the Manni prize were, doubtless, stimulated to action by the most honorable motives. The nation had not only taken this matter to heart, but had sounded the tocsin to the whole world, in nu-

merous elaborate treatises against burying people alive. M. Bruhier's book contained 180 frightful examples: 40 persons dissected before death; 27 falsely reported dead; 60 entombed alive, etc. (*Diet. des Sci. Med.* xxv. 174.) As the best informed writers put but little, if any, faith in this book, it is surprising that it should still occasion consternation. The *Revue des deux Mondes*, (Oct. 1848,) calls it a collection of bizarre stories, believed only by those ignorant of physiology and the healing art, and maintains that the author instituted no inquiry into the authenticity of the tales which he relates; that as an authority he is wholly incompetent; that his enumerations originated in his own imagination, and that his work is only calculated to alarm the public, without reason.

French Literature on the dangers of premature interment appears to be extremely abundant: Louis followed Bruhier; Penneau, Louis; Thierry, Penneau; Durande, Thierry; Nysten, Durande; Fonteneille, Nysten. The latter, after forty *experiences* on dead persons, without having found any muscular contractions from a galvanic battery, concluded that these persons were really dead, and that galvanism is the great test of life and death; an opinion as erroneous as it is universal. But the organon of terrorism originated with a distinguished member of the Academy of Sciences. About three years before the institution of the Manni prize, the work of M. Julia de Fontenelle* appeared. The doctrine of this, and of similar books, must interpose a barrier to the progress of pathological anatomy, and, by consequence, to the progress of the healing art, as it utterly forbids the early examination of the human subject by every principle that forbids homicide. The position taken by the physicians of New Orleans, in favor of early dissection, is at once rational, and, perhaps, unexampled in a practical point of view. All must admit that the sooner the seats of morbid alteration be examined, the better, and that, at a late period, physical and chemical changes are apt to obliterate the foot prints of disease, and to mislead the inquirer.

Among all the dissections I have made and witnessed, within a few minutes after death, (in its usual sense,) amounting to several hundreds, I never saw any indication of life, (in its usual acceptation,) nor have I ever heard that any other person, since the foundation of the city, had seen a case of the kind. If dissection calls so many to life in France where that process is never allowed until twenty-four hours after death, surely, the same ordeal in New Orleans, where there is, or used to be, a delay of little more than the same number minutes, ought to have a similar effect.

Several years after M. Fontenelle's book was published, he brought forward this alarming subject with renewed seriousness and zeal, as may be seen in the *Dictionary of Sciences*. (*Dict. de la Convers.*, xxxix.)

* *Récherches Medico—Legales sur l'incertitude des signes de la mort, les dangers des inhumations précipitées, les moyens de constater le décès et de rappeler à la vie ceux qui sont état de mort apparent.*

In England, no medical author of reputation has written at any length on this subject. (Guy's Med. Jur., 371.)

The cases of resuscitation from apparent death, which M. F. reports, were not witnessed by himself, nor were they established as facts by evidence of a satisfactory character, having nearly all been newspaper stories. Instead of giving an analysis of his cases which I had translated, I will substitute a few extracts from a recent criticism on that work—not so much for its logic, as for its expositions on the general aspects of this subject, in the *British Empire*: “M. Julia de Fontenelle seems to have persuaded himself that burial grounds are a species of human slaughter-house. His hopes of recruiting population from church yards are grounded on a hundred cases of apparent deaths gleaned from the entire history of the world. Nor is there in the whole of his book, one single case bearing out his position. It is no unreasonable scepticism to assume that the majority of the persons revived never lived. Yet not only is this book still in vogue, but the French newspapers annually multiply these tales to an extent which would be frightful if they were not refuted by their very number; but we [English.] are tame and prosaic in our insular tastes. Our agreeable neighbors require a stronger stimulus, and therefore endless changes are rung upon the theme of living men buried, and of dead men brought to life again. In Spain, if M. Fontenelle's word is a warrant for the fact, whoever oversleeps himself will have to finish out his slumbers in the grave, which beyond doubt, is the most powerful incentive to early rising that was ever devised. But in France, the grand theatre for these harrowing tragedies, it is usual to bury on the third day; and if at that interval it was common for seeming corpses to revive, we, in this country, [England] should be habituated to behold persons, whose deaths had been announced, to rise up and doff their grave clothes. Who ever *heard*, in Modern England, of a person, who *had* been numbered three days among the dead, resuming his vacant place among the living?” (Lond. Quart. Rev., Oct. 1849.)

I am not aware that the records of the United States furnish a well authenticated example of revival from apparent death, at the length of even a few hours after the ordinary signs of death had occurred. The most remarkable supposed case of this kind, which still agitates the public mind, is that of the late Philip Doddridge, an eminent lawyer and statesman, of Virginia, a gentleman with whom I was acquainted, having been the family physician to one of his sons. The story, founded partly in fact, has been variously related, but never confirmed, by competent witnesses, as to manner, duration, signs, tests, and essential conditions. A case of apparent death, from yellow fever, reported by Dr. John Rush of Philadelphia, though not until six years after its occurrence, is related in Dr. Cox's Medical Museum for 1805. The patient James Clark, aged 19, affected with yellow fever, died with black vomit, on the fourth day. During the apparent death of four hours duration, the doctor gave a gill of strong brandy, every half hour etc. Is it not remarkable that a *living* man should recover after black vomit? Is it possible for a dead man to swallow so much brandy? Is it likely

that such a case, which was witnessed by many, according to this narrative, could fail to produce great excitement, and consequently, a thorough investigation—a complete verification, and an immediate publicity, and the more so, as it was infinitely honorable to the doctor, and advantageous to the cause of humanity? * After all, this is the best authenticated case that I have met with.

The evidence in the alledged resuscitation of the Rev. Mr. Tennant, many years ago, is altogether unsatisfactory. In both of these cases, the hope entertained, rested on the persistence of the animal heat; this of itself, as I have fully proved in several hundred cases, affords no evidence of the presence of life, at least in fevers and cholera; indeed, it is in some instances, a proof of the reality of death—for after death, and only after death, does the animal heat reach 113° of Fah.—an elevation which I have noticed in the centre of the thigh. The rectum often gives a heat nearly as great after death.

According to the London Lancet, (1845,) inhumation, in England, does not take place until one week after death—frequently not before a fortnight has elapsed, which is common in the metropolis and neighboring counties; *but frequently the time is prolonged to three weeks*, putrefaction in its most horrible form, going on from day to day in small unventilated apartments.

Professor Guy says, "In England the body is never committed to the grave until putrefaction takes place," (Med. Juris. 372)—a useless delay since it saves nobody among the dead—annoys the living, and interposes barriers to the progress of pathological anatomy and the healing art.

In New Orleans, burial follows very soon after death, particularly among strangers dying of yellow fever, sunstroke, etc. There ought to be a public Dead House for the city. Men while walking the streets are sunstruck, and die in thirty minutes, and, in some cases, are carried to the grave yard, three hours afterward, as I can testify. Private families have no relish for the companionship of a corpse.

Surely, then, the English do not bury their compatriots alive. In no country ought resuscitations from apparent death to be so common. And, yet no one comes to life again in that great empire! The medical journals, early in 1846, contained the following summary of premature interments in France, taken from the French themselves: "*Premature Interments.*—It is stated that the cases of premature interment in France, prevented by fortuitous circumstances, amount since the year 1833, to 94. Of these, 35 persons awoke of themselves from their lethargy, at the moment the funeral ceremony was about to commence; 13 recovered in consequence of the affectionate care of their families; 7 in consequence of the fall of the coffins in which they were inclosed; 9 owed their recovery to wounds inflicted by the needle in sewing their winding sheet; 5 to the sensation of suffocation they experienced in their coffin; 19 to their interment having been delayed by fortuitous circumstances; and 6 to their interment having

* Professor Guy in his Medical Jurisprudence, inclines to think that some authentic cases of restoration to life have occurred, "though no other subject connected with forensic medicine, can boast of so large a collection of strange and improbable fictions."

been delayed in consequence of doubts having been entertained of their death."

The writer already quoted, estimates the average period, between death and inhumation, in France, at three days; during this time a multitude are restored to life, to say nothing of those buried alive! The members of the Academy, often argue in favor of protracting this period still longer, and very frequently the English practice is appealed to as a model for imitation! This is logic inverted. The English in two to three weeks save none! The French in three days save many! The English ought to imitate the French method, and, perchance, they may have the good luck to awaken some one.

MM. Bayle and Gibert, (Dict. de Med. II 122,) have collected fourteen cases, no better authenticated than those of their compatriots. The eleventh case, copied, as usual, from a newspaper, (Le Temps, 2 mars 1835,) is on this wise: an infant, aged two years, died at Munich—was carried to the dead house, (la maison mortuaire,) where it remained, according to the rules of the city, until the time of burial; at which time, though enveloped in its winding sheet, it began in the gayest manner to play with the flowers that had been strewn over its body! The authors naively add: "This case demonstrates the extreme importance of mortuary establishments. In France, this infant would have been interred alive." Now, the internal, or physiological evidence which this story necessarily implies, is worthy of consideration. Let a healthy child lie three days in a fixed, constrained position; the parts that sustain the weight of the body will be inflamed, perhaps mortified, and the child of that age will be nearly, if not quite, starved, to say nothing of the effects of the disease which caused its supposed death. Now, a little knowledge of the nursery would, or ought to convince any one, that a babe of two years, under these circumstances would cry with all its might, instead of playing gaily with flowers—"jouant gaiment avec les fleurs dont on avait paré son corps." These writers deplore the unhappy condition of France, on account of the imminent danger which exists in that country of being buried alive—"Terrible danger d'être enterre vivant." So stood this story of the child in 1836. Nine years after, M. Leguern, in his petition to the king of the French, against the burying of people alive, makes this child *four* years old. She is found *sitting* up in her coffin playing with *white* roses. At the same time, this gentleman* declared, that since 1833, no fewer than 46 cases of premature interments were prevented by pure chance, within the immediate circle of his own observation; four were saved by falls in their coffins, three by wounds from pins in their shrouds, &c. These were saved by *pure chance*! How many more must have been saved by design; that is, by suitable treatment! If M. L. saw 46 revived by *pure chance* in 12 years, it is fair to conclude that such good luck must have suggested the propriety of applying both art and science to this good work. If M. L. saw 46

*I quote M. L., as reported in the NEW ORLEANS BEE. (Aug. 13th, 1845, from the *Réforme*)

saved by pure chance, by the aid of science, he must have made up an even hundred. Now, if there be 75,000 physicians and health officers in France, all equally fortunate, there is at least half a million annually restored to life! But, if we take the revivals owing to pure chance, which happeneth alike to all, the aggregate in 12 years will be, for France alone, three millions and a half; for the whole world, about 100 millions, to say nothing of as many more smothered in their graves. How happens it that France requires 139 years to double its population,* seeing that the resurrections must equal one third of the deaths, on the supposition that other medical men are as fortunate in their purely accidental experiences as M. L.?

Some of these resurrections are very romantic. Lovers disinter lovers. Madame Renelle, (formerly Mdle. Sapausageade,) died in 1810; was buried, not in a vault, but in the ground; M. Bossuet, (a poor *litterateur*, but an old lover,) then in a remote part of France, having heard of her death, undertook a long journey in order to get a lock of her hair. He dug her up at midnight, and found her alive! She married him forthwith—fled to America—returned in twenty years to France; whereupon, M. Renelle, banker, her husband, claimed his wife; but the judges gave her to Bossuet. Now, this lady, how live soever she might have been at her interment, could not have remained so many days without fuel, food, air, and other conveniences.†

I return from this digression to the subject of the Manni prize, which was placed, by a royal decree, at the disposal of the French Academy in 1837. The subject was important. The public had a natural aversion to living entombment. How to avoid this was the great question. The philosophers, as well as other people, without hesitancy, admitted that putrefaction was a certain test of death, but in nothing else could they agree. The prize of the Abbe Manni was founded with hope of discovering some other satisfactory sign *anterior to that of decomposition*, for the inconvenient delays, and the deleterious effects of keeping the dead until this repulsive change had taken place, were obvious, and were the very things to be anticipated and prevented.

Besides, in some climates,‡ the test of putrefaction would not occur for weeks or months, unless the rooms be artificially heated to a high temperature, which, to the poor, would be both inconvenient and expensive, and often impracticable during epidemics, and, in cases of contagious diseases, unsafe. The prize question did not contemplate this *test at all*, seeing that it comes too late.

* D'Angeville, Statist.

† This *penchant* of resurrected wives for marrying lovers whom they had inconsiderately rejected, explains a maxim ascribed to a French philosopher, namely, marry whom you will you will afterward find that you have married quite another person. A case is related of a different character: the carriers of a dead lady, in turning, struck the coffin against a corner, which recalled the lady to life. Some years after, having died again, the husband charged the carriers to be careful in turning the corners of the street.

‡ In Russia, during the long winter, the animals killed for food are preserved wholly by the climate, no salt or other antiseptic being needed. The meat is stowed away or hung up in market, is frozen at once, and continues so till spring.

It is conceded, that the award of the Academy was made conscientiously; that the paper crowned with the prize, was the best among the multitude offered; and that the Academicians are, as a body, unsurpassed for general learning and science. But the Academy has no monopoly of nature, nor of her true interpretations. Her platform of facts and her voice of truth are alike accessible to all mankind; and her best Academicians are those who read her volumes most correctly.

According to M. Bouchut, the successful candidate for the prize, the "certain signs of death are *immediate or remote*. The first consists in: 1, the prolonged absence of the sounds of the heart; 2, the simultaneous relaxation of the sphincters; and 3, the sinking of the globe of the eye, with loss of transparency of the cornea. The first of these, alone, is regarded by the committee as conclusive. The *remote* signs are: 1, cadaveric rigidity; 2, the absence of muscular contractility under the influence of galvanism; and 3, putrefaction."

The first cannot be a very general test. For, passing by this test as *satisfactory in itself*, its application must be limited, because there are but few good stethoscopists among good practitioners, and, in the best hands, certainly is often not attainable.

I speak not of the ideal, but of the actual state of auscultation. In some cases where able auscultators have pronounced the heart altered or diseased, I have found it healthy on dissection. This is one difficulty. But this is not the worst. The Academy, and M. Bouchut, take for *granted*, that which may not be *true, and which is the very thing to be proved!* Who has proved that the heart, like the pulse, like every other organ, may not fall into *temporary quiescence or inaction*? May not the heart itself suffer apparent, not real death, as all analogies drawn from other muscular organs teach? The sphincters, uterus, intestines, and stomach, the respiratory, lingual, ocular, and locomotive muscles may be palsied, inactive, apparently dead for a time. It is a downright begging of the question, to assume that the heart *cannot itself fall into this very state of apparent death*. The natural history of the movements of the heart, indicates the probability of a temporary suspension of action; at one time it gives 200, at another 8 or 10 strokes in a minute; it intermits, or is irregular. In cholera it is probably cramped in some cases; temporarily quiescent in others. Moreover, it has, in common with other muscles, a kind of life of its *own*; it is not the known sole criterion of general life. Comparative physiology shows that an animal may live hours without the heart, and the heart for days* without the body. An alligator's heart will act with regularity for many hours, perhaps for days, after having been cut out of the body, and emptied of its blood. Let an alligator thus deprived of its heart, be roasted; return its heart, and apply the stethoscope, and then the dead will afford this certain sign of life! The commission of the Academy cannot object to

* This I cannot vouch for as an observation made by myself, but Dr. Lindsay, of this city, has seen the separated heart of the alligator still in action, on the second day after its removal from the body, which I fully believe, though, I have never watched the heart more than 6 to 9 hours continuously after separation.

this argument, because they themselves experimented on the inferior animals in testing M. Bouchut's claims : as for myself, I have shown, in my published papers, that I attach less importance to comparative physiology, as the interpreter of human physiology, than systematic writers do themselves. If I take their own point of departure, they can require nothing more.

M. Dumas, author of the Article *Cœur*, in the Dictionnaire d'Histoire Naturelle, quotes Bacon, Haller, and Diemerboeck, who state, that in man, the heart may be removed without suddenly extinguishing life, and that men have looked about, spoke, and prayed after having lost their hearts by the executioner; though M. Dumas does not vouch for the truth of these statements. (iv. 289.)

Moreover, has any one asserted, much less has any one proved, that the action of the heart is always appreciable; that it never can be so feeble as to escape observation, remote as it is from sight, and even from the hearing? To say with the Academy, that a *prolonged absence* of cardiac sounds, is an absolute proof of death, is vague and unsatisfactory; *prolonged absence* of animal heat, or of respiration, would equally prove the reality of death, not to mention other tests, as rigidity, &c.

The very object contemplated by the Manni prize, is to dispense with this prolongation; for, if a prolongation be necessary, there is an infinitely better test; one absolutely certain, the characteristics of which all know as well as the Academy, namely, putrefaction, and which ought not to have entered into the enumeration of M. Bouchut at all. Had M. Bouchut adopted as the criterion of death, the prolonged absence of respiration, the test had been equally, nay, more certain, and, withal, of easier application, than the uncertainties of auscultation. "If the respiration," says Dr. Paris, "be suspended only *five minutes*, we may conclude that life is fled forever. Of all the acts of animal life, this is by far the most essential. Breath and life are properly considered in the Scriptures as convertible terms; and the synonym, as far as we know, prevails in every language."

As M. Rayer, reporter, and his coadjutors of the committee, regard this auscultatory test as the principal feature of M. Bouchut's essay, it is proper to look a little further into this matter. M. Rayer and the commissioners made some experiments on the human subject, and on animals; from which they conclude, with M. Bouchut, that "the absence of pulsation of the heart for *five minutes* leaves no doubt of the cessation of life;" but how many experiments they made does not appear: let us suppose fifty. Now, from the very nature of the case, this is but a negation; a *non sequitur*; for it might have happened, that all, or a portion of the next fifty cases would have revived after a *temporary cessation* of the heart's action. Suppose the commission had tried the non-respiratory test for the same period, namely, *five minutes*; would they have found any revivals? Would they not have been able to draw a conclusion equally certain?

The Shakspearian criteria of death will probably not fail once in a thousand years, if ever :

Lend me a looking glass,
If her *breath will mist or stain* * *
Why then she lives.

He also has another similar test; that is, the suspension or application of a feather before the lips :

By these gates of breath
There lies a downy feather, which *stirs not* :
Did he *suspire*, that light and weightless doom,
Perforce must move.

The Friar tells Juliet what the signs of death are :

——— “ *No pulse shall keep*
His natural progress, but *surcease to beat* ;
No warmth, no breath ;
The roses on thy lips and cheeks shall *fade*
To paly ashes ; thy eyes’ windows *fall*.
Each part *deprived of supple government*,
Shall *stiff and stark, and cold appear*. * * *

Did the Academy find these signs fallacious ? Is not the Shaksperian the enumeration the same as that of modern physiologists ? The circulation ceases; the body cools ; the breathing ends ; an ashy palor replaces the natural hues ; the cornea grows dim and relaxes ; rigidity prevails. These signs may safely challenge, for certainty, all those of the stethoscopes of the whole Academy.

The loss of respiration, tested by sight, by the misting of the looking-glass, and by the suspension of a feather before the lips, though good tests may be fortified by other respiratory phenomena, which have been but little noticed in this connection, by poets or physiologists, namely, the *peculiar progressive, or rather retrogressive manner by which respiration recedes from the lungs to the trachea, from the latter to the larynx, from the larynx to the mouth, and from the mouth to the very lips* ; this is characteristic, nay, conclusive, if I may judge, of true death, though I do not know that it has ever been regarded at all. It is indeed very different from the cessation of breath in cases of suspended animation, or apparent death, in hysteria, catalepsy, croup, convulsions, strangulation, fainting and the like. The manner of the cessation of respiration, though indescribable to the inexperienced, is very peculiar, and is the earliest absolute sign of real death. The præ-mortem signs of death are very conclusive.

The second great sign of death is, according to M. Bouchut and the Academy, the relaxation of the sphincters. When I say that this is as great a mistake as was ever uttered, I speak from an experience, in this particular line, that probably has never been equalled—I can hardly imagine that any sane experimenter will take the same pains in its verification—a verification incidental to several years’ experiment on

animal temperature,—a single experiment often lasting several hours, during which thermometers have been repeatedly passed within the sphincters. The latter, with very few exceptions, contract strongly after death. Relaxation of the sphincters is not a post mortem, but an ante—or præmortem phenomenon. It happens, sometimes, as a disease, and it is not a fatal symptom. I have seen the sphincter ani completely palsied, open, shapeless. Its relaxation is a frequent occurrence during the agony; but when that ceases, the tonicity of the sphincter ani, for example, returns immediately, and, what is more, after prolonged artificial dilatation with the thermometer, quickly closes, preventing the escape of large accumulations of liquids, as in cholera, yellow fever, etc. In passing through the wards of a hospital, an observer will notice among the dying, even in the visage, relaxations, which will often disappear in a few minutes after death. It is before, not after death, that the orbicular muscle is relaxed, the mouth open, the under jaw fallen, and so on.

The third and last sign relied on by M. Bouchut and the Academy, “is the sinking of the globe of the eye, and a loss of transparency of the cornea.” This sign has long been much insisted on; but it utterly fails as a uniform criterion of death, as I could show. I will only remark that this change happens before death in some cases, and often it does not appear after death in time to be useful, particularly, in some cases of death from yellow fever, the eyes remaining prominent for a considerable period, even for hours. The cornea, in many cases, can be preserved for hours in a transparent state by closing the lids, and carefully excluding the air. The experiment will be the more striking, by keeping one eye open, and the other shut; the former soon becomes dim or glassy from simple desiccation; in the absence of natural secretion; the latter will be nearly as clear as in health.

Does not the globe of the eye recede, and its convexity diminish before death, in many cases of cholera? I incline to the affirmative.

The cornea may become *flattened, dry, and without transparency before death!* This fact, to me quite new, can be well authenticated, if necessary: 1849—Feb. 11th; James Garner’s child, a female, born in England, aged three—sick three days with cholera complicated with congestion of the brain; insensible for twenty-four hours; cramps; severe clonic convulsions, sometimes general, sometimes local; otherwise motionless; takes no notice; eyelids widely open and fixed, as in staring; never winking; *cornea dull, glassy, flattened* in appearance; as dry as paper. Washes caused no winking. Feb. 12th; *the desiccation of the cornea increased, flattened, lustreless*, almost horny; pupils dilated, insensible to light, fixed—a gummy mucosity exuding from the conjunction. The following day, the condition of the eyes was the same. The coma increasing, the child died. Here, *before death*, is an example of the very changes in the eye, so much relied on as the sign of death, with this difference, that among many hundreds of the dead, it would be difficult to find a more aggravated and frightful case, anterior to putrefaction.

The Revue des deux Mondes, (Oct. 1848,) hails M. Bouchut's important suggestion of auscultation, as the test of death, as a discovery absolutely perfect, leaving nothing more to be desired, dissipating every fear, even in the most timid, as to the danger of premature interment, and, thereupon, glorifies France, as the benefactor of the whole human race, in these exulting words: "C'est à la France, il est bon de le rappeler en finissant, que revient le double honneur d'avoir, la première, posé le problème des signes de la mort sur le terrain scientifique, comme de l'avoir, la première aussi, scientifiquement résolu."

I propose the thermometer as a means of testing death, possessing, as it does, superior certainty over the stethoscope. The latter method takes for granted, that in apparent death, the heart's action continues; that it cannot be for a time suspended, and that its action can always be heard! The very analogies of apparent or temporary death seem to oppose or contradict these assumptions. The analogies and the positive facts known of animal temperature, teach that, during life, the body is not heated and cooled like inert matter. Place two or three thermometers in the arm-pits—in the bend of the arm, (the fore-arm being flexed,)—in the mouth and within the sphincters, to ascertain the heat of the surface, and of centres, (the rectum is the best, and most accessible centre). The application of the thermometer requires no skill, and is open to the inspection of all, and is a test for all the warm blooded animals—at least for man. While the auscultatory test takes for granted that there can be no temporary inaction of the heart, and that all its motions can be heard; the thermometrical test takes nothing for granted without the most indubitable proof. Its great axiom is that man, in his living state, maintains an uniform temperature, independent of the surrounding media, while a dead man, like other inert matter, has no independence of this kind, but steadily responds to, and is governed by, calorific conditions altogether physical—heating and being heated, receiving and radiating caloric. This is not the result of speculation, but of prolonged and varied experimental research.

The refrigeration of the body before death, in cholera, congestive, and the like, is not physical refrigeration, responding to the calorific condition of the surrounding media; it is a morbid, or physiological caloricity, which, for a time, augments or continues stationary after death, until it shall be replaced by physical refrigeration, as its phenomenal history clearly shows.

The facts which I have published concerning post mortem caloricity, do not invalidate this thermometrical test; for soon, or late the physical refrigeration must take place. I may here add, that the speculative opinion which prevails among those who do not take the trouble to make experiments, namely, that these calorific movements are the effects of putrefaction, is wholly unfounded, (so far as it regards the human subject;) how much soever it may be countenanced by certain analogies derived from other inert matter. The calorific, and the putrefactive periods, so far from coinciding, antagonize each other, so long as the heat is not in accordance with the ordinary physical laws of ca.

loric. The point of coincidence and equilibrium, is really the point of putrefaction, unless the circumstances be of an extraordinary character, such as involve the freezing point, or that of torrefaction. But the predomination of the invariable law of physical refrigeration, is a criterion always attainable, and may be proved, as to its times, distances, and velocities, by arithmetical calculation: ascertain the temperatures of the media, and of the heated body; the velocity of the refrigeration will be proportioned to the times and distances, and will proceed from the surface to the centre, until the equilibrium be attained. The only objection that lies against this rule relates to calorific conditions, where the differences between the heated body and the media are very slight; but this is of no importance in practice, because there is always a marked difference between the average temperature of the air in the shade, and that of a living, or recently dead person.

The technical phrase, *THE AGONY*, whether regarded in its esthetical, or pathaological sense, is an unfortunate one, inasmuch as it conveys an exaggerated notion of the pain incidental to the last struggles of life. The great physical and physiological alterations presented, do not indicate the measure of the misery endured. The countenance, it may be, is profoundly altered; the voice feeble; the respiration irregular, rattling; the eye rolled upward; the strength gone, &c.; yet, those changes so frightful to the beholder, are illusions, and are not, in general, the indicants of a concentrated agony: for sensation *itself*, wanes, so that the actual suffering bears no comparison to that experienced in the inception and progress of the disease, anterior to the agony. Parturition, which is not called a disease, is more painful than many cases of death. Gout, rheumatism, ear-ache, tooth-ache, calculus, colic, neuralgia, whitlow, white-swelling, and the like, often transcend the pangs of dissolution. It is not a concentration of feeling, but the loss of it, that oftenest characterizes death. One of the principal illusions on this subject, grows out of the irregular or convulsed movements of the muscular system. These movements are not to be taken as the measure of sensation. Indeed, they have no necessary connection with feeling at all. I have seen several dead bodies (from cholera) undergoing apparent convulsions, cramps, and contractions of the muscles of the face and of the mouth, which, according to the usual anatomical expressions of pain, might be profitably studied by the painter and sculptor, since they are similar to those changes produced by intense suffering. A patient sometimes fails to feel his disease, though he may feel everything else. He possesses sensation in all its integrity, so as to notice the touch of a musquito, and feels, with the most exquisite sensibility, the pain of a sinapism, blister, or small accidental burn, as in cupping, while he has little sensation in relation to the malady of which he is actually dying. Many examples of this, recorded at the bed-side, could be adduced. A young man, from New York, on the day of his death, from yellow fever, inquired with much earnestness as to the prospect of his succeeding in his profession in New Orleans. His conversation was rational. He had not the least apprehension of his

impending death. He said he was free from pain. He complained, however, of the coldness of his feet, which, on examination, were found to be, as he represented them to be, very cool. He drove away musquitoes that touched his person without waiting for them to bite. This I have often noticed in persons dying of this malady. Many persons have declared that they were free from pain, or suffered little, except from blisters, cups, or mustard applications. These cause dying persons, in not a few cases, far greater sufferings than the agony, and, therefore, should be avoided altogether, in hopeless cases.

Sometimes, sane persons, in the *agony*, in yellow fever, leave their beds, dress themselves, in order to walk out on business or pleasure. Others sit up, and read novels, as has been reported by some of the physicians of New Orleans. One of my patients, a stranger, during the agony, as well as before, fearing that he would be robbed, kept his money (about one hundred dollars) in his belt, which he took off, and put on, and calculated the change accurately, as often as was necessary to settle his small accounts for medicines, lemons, &c., until his last breath.*

There is much evidence extant showing that death is often unattended with severe suffering. Boileau, the poet, while in the agony, did not appear to suffer. He saluted a friend that entered his room: "good day, and adieu—a very long adieu"—and instantly expired. The poet Fontenelle, just before he died, said that he had no pain; only a little difficulty in keeping up life."

Goethe, at the age of 82, died at Weimer, March 22d, 1832, without any apparent suffering. A few minutes before his death, he called for writing materials, that he might express his delight at the arrival of spring. "If I had strength to hold a pen," said Dr. William Hunter, during the agony, "I would write how easy and delightful it is to die." "If this be dying," said the niece of Newton, "it is a pleasant thing to die." "If this be dying," said Lady Glenorchy, "it is the easiest thing imaginable." "I thought dying had been more difficult," said Louis XIV. "When a by-stander remarked of Dr. Wollaston that his mind was gone, the expiring philosopher made a signal for paper and pencil, wrote down some figures, and cast them up."

The poet Keats, who, as his biographers affirm, and as his epitaph indicates, died of a malicious criticism, playfully remarked in the agony: "I feel the flowers growing over me." Whether this kind of death comes under the head of *euthanasia*, is not easy to determine. In my own practice, I have seen two almost instantaneous deaths, without a struggle, from moral causes. "It is said that Dr. John Hunter intimated, on leaving home, that if a discussion, which awaited him at the hospital, took an angry turn, it would prove his death. A colleague gave him the lie; the coarse word verified the prophecy, and he expired almost immediately in an adjoining room."

New proof that death may take place without pain, is afforded by the recent discovery of anæsthetic agents: as ether, &c. Several persons,

*Immediately after death, this man (a stranger) was robbed.

in different nations, have died, from inhalation, in less than one minute, according to the reports of sundry competent witnesses. The inhalation of ether or chloroform, unmixed with atmospheric air, will, doubtlessly, kill as certainly as hanging. Hence, it is to be hoped, that the benevolent legislators of our country will provide that criminals may elect this pleasant mode of execution.

Fainting, a temporary death, is painless. Death sometimes approaches the character of a perturbed sleep; not more painful, probably, than the night-mare. The snoring, or rattling respiration, is not necessarily accompanied with intense suffering.

The pain of death differs greatly in different cases. In sun-stroke, in the first degree, always fatal, (generally so in less than an hour,) there is not a trace of sensation; as tested by blood lettings, sinapisms, cold water, ice, &c. There is evidence extant, showing that persons who had undergone apparent death, and with it, probably, all the pains of actual death—had suffered little, *except during resuscitation*.

The ideal of death, particularly a violent death, is frightful. Its actual suffering must often be trifling, as in the case of death from a cannon ball. A few persons have expressed a preference for a violent death as being the easiest. Sir John Moore, Nelson, and others, expressed a wish to die, as they did, in battle. "Pliny considered an instantaneous death the greatest felicity of life; and Augustus held a somewhat similar opinion. Cæsar desired the death which was most sudden and unexpected."

With respect to apparent death, (or what is the same thing so far as *sensation* is concerned,) real death from drowning, the testimony appears to show that it is almost painless. The London Quarterly Review says, "The struggles at the outset are prompted by terror, not by pain, which commences later, and is soon succeeded by a *pleasing languor*; nay, some, if not the majority, *escape altogether the interval of suffering*. A highly distinguished officer, still living, speaks of *the total absence of pain* when under the waves; but adds a circumstance of startling interest, namely: that during the few moments of consciousness, the whole events of his previous life, from childhood, seemed to repass with lightning-like rapidity and brightness before his eyes."

Of all modes of execution hitherto practiced, there can be no doubt that hanging is the best. I have seen it performed in the most bungling manner, so that the criminal's legs reached the ground; nevertheless, the death was almost instantaneous, and almost without a struggle. The London Quarterly Review maintains that the evidence is full and complete, showing, from persons restored to life, that death from hanging is as easy as could be desired; all agreeing that after a momentary uneasiness, a *pleasurable* feeling immediately succeeds; beautiful colors, of various hues, start up before the sight, which having been gazed on for a short time, all the rest is oblivion. Although this direct internal evidence cannot be obtained in cases of decapitation, yet external evidence is not wanting to show the persistence of sensation for a *considerable period after* this latter mode of execution. "It is said that the lips of Mary, Queen of Scots, moved and prayed for a

quarter of an hour after she was beheaded. As the word '*murder*' was called into the ear of a criminal who was executed for this crime, at Coblenz, the half closed eyes opened wide, and he stared with an expression of astonishment at those who stood before him. Wendt relates, that, having put his mouth to the criminal's ear, and called him by name, the eyes (of the decapitated) turned to the side from which the sound came."

Death from congelation, frightful as it is usually thought to be, judging from the pain which a slighter degree of cold produces, is nearly free from suffering. Here the proof is abundant. During the retreat of Napoleon's grand army from Moscow, in 1812, cold, in connection with fatigue and want, destroyed more soldiers than battle; amounting to one hundred and thirty-two thousand.* The benumbed soldier laid himself down to sleep in the snow, knowing well, from daily observation, that it would prove to be his winding sheet. Intense cold, it has been observed, produces a tendency to sleep which is at once delicious, and almost irrepressible. To resist, only is painful. The patient prefers yielding to the fascination, fatal though it be. Larrey, the chief surgeon of the grand army, describes death from cold as beginning with paralytic torpor, and ending in an apoplectic slumber. Beaupre, one of his coadjutors, yielded himself to this "delicious sleep," but was fortunately aroused by the cries, oaths, and blows of two soldiers who were killing an exhausted horse that had fallen near him. He arose, leaving eight frozen corpses at the spot where he had been slumbering.

Nature, kinder to man than he is to his brother man, deals gently with the dying, and smoothes the way to the tomb. There is not a single disease in the whole nosology, but what is, in its most painful form, euthanasia bliss, compared with the horrible tortures, particularly by fire, which the Church and State invented and practiced at former periods.

That pious king, Henry VIII, the reformer, publicly executed, often with the most horrible tortures, no fewer than 22,000 persons, in England and Wales, chiefly for heresy against himself and God! According to Dr. Dick, the inquisition caused 31,655 to be burned alive, for heresy, during the 278 years ending in A. D. 1759; and, at different periods, thirty thousand ladies were burned by that tribunal, for witchcraft alone. Science was made to stand by, in order to determine how far torture could be practiced without extinguishing life too soon, lest the sufferer should fail to *taste the agony sufficiently*. The rack, impalement, drawing, quartering, the wheel, the screw, the wedge, and the like, were pleasant, compared with those slow fires which were kindled for such as dared to think for themselves.

In 1827, in Gottingen, and in 1841, in Prussia, the cruel punishment of the wheel was still used.

The victim, stretched around the wheel, after various other tortures, his limbs having been broken, at intervals, in eight places, by blows

* Alison.

with an iron bar, was at length, in some cases, allowed the favor of two or three blows over the stomach, called *coups de grace*! but even these coveted blows often failed to extinguish a tenacious vitality.

The mental and moral aspects of death, deserve the utmost attention of the physician, since it is his duty, as far as in him lies, to

“Minister to a mind diseased,

Pluck from the memory a rooted sorrow,
Raze out the written troubles of the brain,
And, with some sweet oblivious antidote,
Cleanse the stuff'd bosom of that perilous stuff
Which weighs upon the heart.”

Hope is an excellent medicine. If truth be natural, so is hope. Hope lingers to the last—a consolation, which, unfortunately, the professor of the healing art, is less likely to enjoy than other people, though, he, too, is apt to expect recovery under the most desperate circumstances of incurability. Instead of necrological meditations and fatal prognostications, expectation ought to be administered to the sick, as far as is practicable without moral dereliction. The whole of man's nature, physical, moral, and religious, ought to be regarded, so far at least, as they influence healthful, or morbid action. They are the true elements of that euthanasia, which, next to the restoration of health, ought to be the object of every physician. Indeed, in the treatment of disease, a strong belief or presentiment of impending death, is an unfavorable circumstance, sometimes causing, and often accelerating a fatal termination. Even resignation, some one defines by the word *despair*. “Flechier, the divine, had a dream which shadowed out his impending dissolution. He sent for a sculptor and ordered his tomb. Begin your work forthwith, he said at parting; there is no time to lose: and unless the artist had obeyed the admonition, death would have proved the quicker workman of the two. Mozart wrote his Requiem under the conviction that the monument he was raising to his genius, would, by the power of association, prove an universal monument to his own remains. When life was flitting fast, he called for the score, and, musing over it, said, “Did I not tell you truly that it was for myself I composed this death chant.”

In sickness, and in death, the mental, the moral, and the pathological are alike powerful. Goethe ascribed the faulty passages in Schiller to his occasional attacks of disease; these, therefore, he denominated “the *pathological passages of Schiller*.” Duroc, who fell mortally wounded at Napoleon's side, derived infinite satisfaction from the sympathy and from the words of the agonized Emperor: “Duroc! there is another world, where we shall meet again!” Every candid physician must acknowledge the therapeutic benefits derived from the Christian philosophy, in clinical practice.

Death may result from the influence of mere imagination. A striking example, with the names of the parties, is given in a recent number of the London Quarterly Review: Two profligate individuals, whose high positions in the religious community at Rheims, gave to their words

and actions great authority, called at night upon a religious woman, and, in a jest, "exhorted her as a person visibly dying. While in the performance of their heartless scheme, they whispered to each other, she is just departing—she departed in earnest. Her vigor instead of detecting the trick, sank beneath the alarm, and the profane pair discovered in the midst of their sport that they were making merry with a corpse."

The mind sympathizes with the body, throughout the course of most diseases, and the closing scene is frequently attended with, not only weakness, but derangement of the intellect. The ideas expressed, in the delirium at the closing scene, are generally those most habitual to the personal pursuits of life. "Dr. Armstrong departed delivering medical precepts. Lord Tenterden, who passed straight from the judgment seat to his death bed, fancied himself still presiding at a trial, and expired with, *Gentlemen of the jury, you will now consider of your verdict*; Dr. Adam, the author of the Roman Antiquities, imagined himself in school, distributing praise and censure among his pupils: *But it grows dark*, he said; *the boys may dismiss*; and instantly died." I could add many examples of a similar nature, which have fallen under my own observation. In not a few cases, the last sayings of the dying are incoherencies, uttered without a consciousness of their import, being wise only by habit, and by accident. "De Lagny was asked the square of twelve, when he was unable to recognize the friends about his bed, and mechanically answered *one hundred and forty-four*." The last words of Napoleon were "Tete d'armée."

Independent of experience, the physiologist cognizes no inherent necessity in life itself, nor in its organized forms, for a catastrophe so melancholy as death—so little analogous to the teachings of the material universe, wherein stability reigns, or varies only in constantly recurring cycles. The stream of life still debouches in a tenebrious realm, as in the days of the fabled Nox, Mors, Somnus, and Styx.

How transient is human life, compared to that of a tree!—There are cedars on Mount Lebanon, that had already flourished several centuries before the Christian era began. There is a sycamore on the Bosphorus, 4,000 years old. There is a yew tree in England aged 2,880. De Condolle mentions trees aged from five to six thousand years—cotemporaries of Adam, if the Usherian chronology be correct.

If the doctrine of animal perfectibility—if new organs can be acquired in consequence of mere desires and wants; and if it be impossible ever to lose these organs and faculties, so acquired, as contended for by Lamarck, the prolongation of life to an indefinite extent is a possible event. To these visionary theories, this great writer devotes the first volume of his Natural History. His argument, however, is one of much ingenuity.

I may be permitted to say, though, perhaps, in repetition of what I may have already said, that the natural history of death is a most luminous point of departure for the illustration of the science of life, or biology, as it is most appropriately called; that is to say, the progress, and the order in which the tissues, and, consequently, the functions, die,

serve to dissect, to analyze, and establish certain laws of vitality. The great idea of Bichat's General anatomy, that of resolving the body, with its organs, into its elementary tissues applies here, though, strangely enough, Bichat himself failed to use it in his book on Life and Death; for, instead of tracing death in its natural order, in the tissues, he divided it into three varieties, namely: death in the brain, death in the heart, and death in the lungs; a topographical arrangement at war with his brilliant conception of tissues, which formed a great era in science. Different systems, as the nervous, the capillary, the muscular and the like, have vital functions or laws of peculiar nature, which die in a peculiar manner, or at least, in different times. Hence nutrition, respiration, calorification, circulation and muscular motion, cease not simultaneously. In some cases, one tissue or function is disordered, or devitalized, in advance of its associated tissues and functions. Suppose the blood to be (as indicated in the Pentateuch) a vital fluid.* Might it not die in advance of the nerves, or the muscles? and, so of the rest. I will further add, (having omitted the statement in the proper place,)[†] that the thermometer is a test applicable to the condition of the blood, with reference to its vitality: blood wholly deprived of vitality, or to speak without any theoretical opinion, blood that has undergone refrigeration; that is to say, blood just taken from the arm in yellow fever, inflammation of the lungs, and the like, will resist the physical law of refrigeration much longer than blood taken in like manner, provided that it has been once refrigerated, and, then, *reheated to the same temperature*. The experiments on this subject, which I published many years ago, though few in number, clearly prove this; but it is my intention to repeat them for the greater certainty, believing them to be new in plan and execution, as well as important in determining the physiology of the blood, particularly in reference to its *vitality*, and the resulting argument that might hence arise, in favor of its *self-locomotive power*, &c. If the blood recently taken from the body, has in any degree, the independent power of resisting the surrounding atmospheric temperature, it possesses, in that case, one of the most remarkable proofs of vitality, being, of course, independent of nervous, respiratory and the other influences of the organs. Bichat, (not to name others) makes this calorific independence, the characteristic feature of life. (Anat. Gen. T. I., 521.)

I will add, as the result of experiment, that death, in the ordinary sense, does not destroy an infusorial animal, which, so far as I have examined, constitutes a great proportion of all animal and vegetable substances, including the proper infusoria of authors. This animal is seen only in the sun-light, and by microscopes of very moderate powers; boiling, and heating, and the desiccation of thousands of years, do not impair its activity. All animal and vegetable substances that can be

* When I was admitted a member of the Medical Society of Baltimore, I was required to defend, orally, the doctrine of the vitality of the blood, which, at that time, was contrary to my own opinion; but at the close of the evening's debate, the majority decided in favor of the proposition which I had reluctantly advocated.

[†] This, (like nearly all of my papers) was written in fragments, one portion having been in the printer's hand, while another remained to be written

dissolved, will afford this active infusorium. It is probable that it neither grows, nor dies; at least, all of the family are alike in appearance, and it is probable that shells, and some fossils, contain this animal in the living, but, necessarily, inactive state. Diminished cohesion of the intermedium in which they are imbedded, (when solid,) that is, solution, is the essential condition, without which their motion is impossible, for physical reasons.

Finally, although it is idle to discourse of the certainty of death, since it is of all things the most certain, there is however, one transcendental view, or possible fact, in its natural history, which the progress of the science of life may possibly reveal with a certainty, that would greatly affect the mental, moral, social, and physiological conditions of mankind. Judging from the progress of modern discovery, preluding, as it does, other greater discoveries, it might possibly happen, that the fundamental laws of life, and organization, with their essential conditions and ends, shall be discovered, so that the duration of life might be ascertained before hand.

The finalities or purposes of vitality—its reproductive power, supplying, in some animals, entire limbs and organs that had been accidentally lost—its definite cycles, as in gestation—its symmetrical development—its variations within the limits prescribed by a marked unity in groupings—its multiformity within the oneness of the archetypal form—its peculiar manifestation in each tissue, and its totality in the entire organization as influencing sensation, locomotion, circulation, respiration, nutrition, calorification, and the like, have all been more or less illustrated by the rapid advances of modern investigation. A few months ago, a painless amputation would have been regarded as impossible as the discovery beforehand of the very hour of natural death, as resulting from the laws of life and organization, under the influences of age, or morbid action.

Hence the solution of the problem of life, in its details, comprehends the duration and termination of life—the period when the candle of life shall burn out, when the vital capital shall be wholly expended. Unhappy will it be for the physiologist, if on entering the penetralia of life, he shall there read the very hour of his own death, inscribed on its structures; that hour,

“When the wheels of life at last stand still,
Like a clock worn out with beating time.”

Happily for mankind, science has not yet made that paralyzing discovery.

Addendum, illustrative of the supposition that the heart's action may be temporarily suspended, without actual death: Mr. John Hunter, the celebrated surgeon, long before death, had, according to his own statement, (confirmed by his medical attendants, Sir George Baker, and Doctors Wm. Hunter, Huck, Saunders, and Fordyce,) an alarming spasmodic attack, in *which the heart's action entirely ceased for three quarters of an hour*. “This curious fact in physiology, says his biographer, has never been satisfactorily explained.” Mr. Hunter's intellectual powers remained unimpaired. He sustained his respiration by forced, or rather voluntary efforts.

Addendum on the subject of rigidity :—Rigidity, as a criterion of death, is inconvenient in practice, as it may be tardy in its appearance, and occasionally absent, or of very short duration. Hence its verification requires the constant presence of the physician; otherwise, it might appear and disappear, during a short absence from the corpse, throwing doubt on the certainty of the death, and causing delay in the burial. Still, however, it is a sign of great value, and the manner or order in which it disappears is highly characteristic. The suppleness or relaxation of the muscles very generally take place first in those parts that were the first invaded by the rigor mortis, as, for example, in the neck. Rigidity is liable to other objections; it may be simulated; it may originate mesmerically, and convulsively.



